Community Assistantship Program

Product Tracking (Systems) Alternatives for the Headwaters Forestry Cooperative (HFC)

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Prepared in partnership with
The Headwaters Forestry Cooperative

Prepared by
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FINAL REPORT

Title

Product Tracking (Systems) Alternatives for the Headwaters Forestry Cooperative (HFC)

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For:

The Headwaters Forestry Cooperative Board of Directors.

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Acknowledgement

Searching for a Tracking system for the Headwaters Forestry Cooperative (HFC) has required me to contact and learn from a very cooperative group of people involved, in various ways, with the emerging new field of Sustainable Forestry.

I would not have gathered and effectively evaluated the information given here without the assistance of the following individuals:

Greg Nolan (HFC Board)
Mike Schluender (HFC Board)
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Chuck Ouimette
Laura Terrall (Smart Wood)
Timothy Smith (Wood and Paper Science—UofMN)
Melvin Baughman (College of Natural Resources—UofMN)

Thanks to all!

Table of Content

Executive Summary

The major purpose of this report is to communicate the results of the search for a tracking system suitable for the Headwaters Forestry Cooperative (HFC) and which comply with the requirements for certification set by Smart Wood. Several tracking alternatives are presented. However, it is acknowledge that before one of these tracking systems or any other is selected, HFC must (firmly) decide on the following two major factors: (1) the type of product it will process (certified only or both certified and non-certified), and (2) who will provide the services needed by the coop (members/investors, the coop will own/invest, or a combination of both). These decisions, as well as knowing its potential customers' requirements for its products (some may require barcodes in all products), will determine the types of tracking systems that best suit HFC's conditions. Due to the uncertainty on how HFC will (and should) operate, several scenarios are outlined on this report.

Lastly, this report presents the following three major tracking alternatives for HFC: (1) the method of painting log ends that has been utilized by the **Sustainable Wood Cooperative** in Wisconsin and which resulted in Smart Wood certification; (2) as a variation of painting the log ends, an alternative systems that I have named (for the lack of a better term) the "order tracking system" is introduced here; and (3) due to the HFC Board awareness that a more accurate and efficient tracking system will be soon required, information and quotes for a bar coding system are shown here.

Appendixes are also enclosed, which include all the information, feedback and contacts made during this search. These documents are intended to help HFC to re-contact people with crucial information on the specific selected tracking system.

Detailed Report

1- Justification for Certification

(At the global level) As the world population grows, demand for forest products increases. The ability to meet human needs while conserving natural resources will depend on how we manage ours forests. Timber production, when managed effectively, maintains long-term forest productivity, protects biodiversity and provides social and economic benefits. Well-managed operations greatly reduce the impacts of logging on ecosystems and increase the value and yield of timber.

(At the national level) The growing numbers of consumers who are concerned with the environmental consequences of their purchases are very attracted to forest products from certified companies. They know that by buying certified wood, ancient forests are being conserved, pesticide use is being minimized and soil and water quality is being maintained or enhanced by management activities.

Several studies, done in 1995, show that:

- 50% of US consumers say they would seek out certified forest products;
- 34% would pay more for certified products;
- 64% would be willing to pay more to purchase a home built with certified wood; and
- 70% of furniture and cabinetmakers would prefer to use certified wood.

These results also indicate that consumers know that when they purchase certified forest products, they create a market-based incentive for forest owners to manage their land to a higher standard.

Lastly, it seems well documented that Certification makes sense as a tool to fight major local and global environmental problems and as a business strategy for companies and forest owners to target an important and growing market niche in the wood sector.

2- Smart Wood and its Role

Company claims of good forest management are not enough to satisfy environmentally conscious consumers. Third-party certification is increasingly seen as the most credible way to communicate to the public that forests are being well managed. This has made landowners and manufactures look for independent, third-party certification as a means of improving public perception among those consumers who are concerned about the environment.
Smart Wood is a leader among a growing number of other forest certification initiatives. It evaluates and certifies forestry operations that meet the international environmental standards of the Forest Stewardship Council (FSC). Smart Wood offers two types of certifications, which are both voluntary and open to producers of all forest products. These types of certifications are:

- *Forest Management Certification* evaluates the operating practices of forest landowners, based on strict standards. If standards are successfully met, the operation is certified and timber harvested from that forest may be sold as certified wood.

- *Chain-of-Custody Certification* of primary and secondary manufacturers and wholesalers ensures that only wood that comes from certified forests is sold to consumers as a certified product.

(The focus of the rest of this report is on the Chain-of-Custody Certification)

3- Smart Wood's Requirements for the Chain-of-Custody Certification

The Chain-of Custody Certification describes the process of tracking wood from the forest, through manufacturing, distribution and sale. By auditing each step in the process, the Chain-of Custody Certification assures consumers that the certified products they buy were indeed produced from a certified forest. Any company wishing to buy and sell wood products as Smart Wood certified and FSC endorsed must be Chain-of-Custody Certified.
In a Chain-of Custody Certification, a Smart Wood auditor evaluates a company's inventory control and manufacturing process to assess whether an adequate tracking system is in place to ensure that certified materials are not mixed with non-certified materials.

Smart Wood guidelines for Chain-of Custody Certification include:
- Certified wood should be stored separately from non-certified materials;
- Inventory and production records should track the flow and volume of certified material from point of purchase to point of sale; and
- Invoices, bills of lading and other documents related to shipping or transport should specify the certified status of the product, including the customer's FSC Chain-of-Custody code.

Customers are granted a five-year certificate and Smart Wood is required to perform annual audits to ensure compliance with the guidelines, including purchase and sale of certified products.

4- Ways for HFC to Comply with Smart Wood's Certification

Regardless of the tracking system chosen, a Chain of Custody system, for HFC, must meet the following three conditions:
- First, certified and non-certified wood must be kept separate during the processing;
- Second, a labeling system must be established to both distinguish certified wood as it comes in (to the mill, shop, etc.) as well as to identify it with a FSC label for the consumer when it is marketed; and
- Third, the movement of wood must be demonstrated through a record keeping system to record incoming and outgoing volumes at each processing stage.

HFC may address these three conditions as follows:
- For the first one, HFC should use ONLY certified wood. In other words, HFC membership should be composed of certified landowners. CERTIFIED MEMBERS ONLY!
- For the second, there are several options such as (1) setting up a bar coding system, (2) painting the ends of logs to distinguish different landowners and then having printed tags or

stickers to put on finished products, and (3) simplifying the tracking need by tracking each single order instead of its components. On the April 2nd (2001) meeting, the HFC Board decided in favor of **BAR CODING** instead of painting log ends.

- For the third, the selection of any one of the options given above or their combinations will determine the type of database structure to use.

It is not fully clear how the HFC will be operating. Therefore, I will address the following most probable scenarios:

	HFC has ONE Mill, and ONE Kiln.	Members have SEVERAL Portable Mills, and SEVERAL Kilns.
HFC works with Certified and Non-Certified wood products.	CASE # 1	CASE # 2
HFC works with Certified wood products ONLY.	CASE # 3	CASE # 4

5- HFC's compliance under each scenario.

The following C-O-C proposals are heavily based on that of the Sustainable Wood Cooperative (which resulted in Smart Wood approval).

CASE # 1: HFC has a central processing (certified and non-certified products) site for all its members' wood.

Requirements.
Charts must document the flow of all (certified and non-certified) wood that goes through the log yard, mill, kiln, and warehouse. If services are out-sourced, these companies and all their employees must receive periodic training on Smart Wood procedures.

Step	Procedure
1- Log Yard	Certified logs arrive (Create: LOG TRUCKING SHEET) are graded and tagged (Create: HFC LOG TALLY FIELD SHEET- grading rules and pricing list are on the reverse of the tally sheet) Other information like landowner, resource manager, etc. will be used for Smart Wood C-O-C requirements as well as for landowner and other internal management uses. Certified wood (logs) may or may not be "anchor-sealed", and the color will be "clear", or, "no color". Since the great majority of wood processed at HFC will be certified wood, this procedure will help reduce internal operating costs. Copies of the completed log tally (at the gate) will be maintained in separate (from non-certified) office files. A final summary will be prepared from the "log field tally sheet" for the

	landowner and HFC management/inventory use (HFC LOG TALLY OFFICE SHEET). All "certified" forms and associated paperwork will be WHITE in color. Non-certified logs may arrive from any reliable source and will be recorded using the same log tally sheet "format" as "certified" sheet(s) but with no data entry at appropriate places on color coded sheets. Log ends will be painted orange for ease of identification within the wood yard, and will be kept physically separate from certified logs.
2- Mill	Certified sawed lumber with clear anchor-seal or "no color" will be flat stacked for shipping (rough green), or stickered for air drying and/or loading into kilns for drying. A "DAILY SAWMILL TALLY SHEET" will be completed, along with individual "CERTIFIED" (or "UN-CERTIFIED") LUMBER TAG"'s (water-proof paper) which are attached to each unit (stack) of lumber. These tags include SW-COC information as well as HFC management/inventory tracking data. Copies will be kept in appropriate office files. "Non-certified" wood will be tagged with an orange lumber tag (in addition to orange paint on board ends), and will be similar to and include all lumber information as described above for certified lumber. Copies of tags will be kept in appropriate office files. Non-certified lumber will be kept physically separated from certified material.
3- Possible NEXT STEPS	1- Green Lumber. Lumber may be sold as certified or non-certified "rough green" material. When it leaves HFC's yard, our "chain of custody" paperwork requirements end with the "SHIPPING MANIFEST", and will indicate certification status. Lumber information is included. Customers will be notified (in addition to manifest data) as to load "certification status". 2- Kiln-Dried Lumber. Lumber may also be sold as certified or non-certified kiln dried "rough" lumber. Chain of Custody responsibility is the same as step 3.1. 3- Manufactured Products. When HFC develops in-house ability to re-manufacture kiln-dried rough lumber into finished product, the lumber tag (either white or orange) will accompany the unit of lumber through the kiln, milling process and shipping procedure (described in step 3.1). 4- Value-Adding Activities. HFC is responsible for "Chain of Custody" requirements if an outside “secondary manufacturing” entity processes its wood. Training will be required from HFC to that entity to assure that HFC's wood is received, milled, and re-packaged (by unit) and that associated paperwork maintains the integrity of the "chain-of-custody" process. The finished lumber can be returned to HFC for shipping as described in step 3.1, or, can be shipped from the out-sourced entity location. If the latter occurs, HFC will deliver a finished shipping manifest to be

	attached to finished products at the vendor's location with all appropriate product information, as well as physical notification of customers as to certification status.
4- Data Management	Copies (hard and computer disc) of all appropriate paperwork by certification status will be maintained at the HFC office in a fire proof safe. "Certified" vs. "non- certified" wood information will be kept in separate file folders, and can further be identified by paper color (WHITE vs. ORANGE). The entire HFC processing team will receive training in procedures (including out-sourcing) with annual re-training. New employees will receive initial training as part of job entry orientation procedures. At this date, waterproof lumber tally sheets and shipping manifest forms have to be ordered. Examples are included in this flow chart description. Examples of the final forms will be sent to Smart Wood as soon as they are received.

CASE # 2: HFC has a few members who have invested on equipments to provide HFC with most, if not all, of the services to fully process its certified and non-certified wood.

Step	Procedure
1- On-Site Saw Milling.	Saw miller must be trained in grading certified lumber (on the HFC LOG TALLY FIELD SHEET- grading rules and pricing list are on the reverse of the tally sheet). This sheet or a summary will be prepared from the "log field tally sheet" for the landowner and HFC management/inventory use (HFC LOG TALLY OFFICE SHEET). Non-certified logs will be recorded using the same log tally sheet "format" as "certified" sheet(s) (but with data entry at different places on color-coded sheets). Logs will be cut according to HFC's guidelines. Certified sawed lumber with clear anchor-seal or "no color" will be flat stacked for shipping (rough green), or stickered for air drying and/or loading into kilns for drying. A "DAILY SAWMILL TALLY SHEET" will be completed, along with individual "CERTIFIED" (or "UN-CERTIFIED") LUMBER TAG"'s (water-proof paper) which are attached to each unit (stack) of lumber. These tags include SW-COC information as well as HFC management/inventory tracking data. Copies will be kept in appropriate office files in HFC office. "Non-certified" wood will be tagged with an orange lumber tag (in addition to orange paint on board ends), and will be similar to and

	include all lumber information as described above for certified lumber. Copies of tags will be kept in appropriate office files. HFC office will include other information like landowner's certification information, resource manager, etc. that will be used for Smart Wood C-O-C requirements as well as for landowner, customers and other internal management uses. Certified lumber and its data will be maintained separate from "non-certified. All "certified" forms and associated paperwork will be WHITE in color.
2- Possible NEXT STEPS	1- Green Lumber. Lumber may be sold as certified or non-certified "rough green" material. When it leaves HFC's yard, our "chain of custody" paperwork requirements end with the "SHIPPING MANIFEST", and will indicate certification status. Lumber information is included. Customers will be notified (in addition to manifest data) as to load "certification status". 2- Kiln-Dried Lumber. Lumber may also be sold as certified or non-certified kiln dried "rough" lumber. Chain of Custody responsibility is the same as step 2.1. 3- Manufactured Products. When HFC develops in-house ability to re-manufacture kiln-dried rough lumber into finished product, the lumber tag (either white or orange) will accompany the unit of lumber through the kiln, milling process and shipping procedure (described in step 2.1). 4- Value-Adding Activities. HFC is responsible for "Chain of Custody" requirements if an outside "secondary manufacturing" entity processes its wood. Training will be required from HFC to that entity to assure that HFC's wood is received, milled, and re-packaged (by unit) and that associated paperwork maintains the integrity of the "chain-of-custody" process. The finished lumber can be returned to HFC for shipping as described in step 2.1, or, can be shipped from the out-sourced entity location. If the latter occurs, HFC will deliver a finished shipping manifest to be attached to finished products at the vendor's location with all appropriate product information, as well as physical notification of customers as to certification status.
3- Data Management	Copies (hard and computer disc) of all appropriate paperwork by certification status will be maintained at the HFC office in a fire proof safe. "Certified" vs. "non- certified" wood information will be kept in separate file folders, and can further be identified by paper color (WHITE vs. ORANGE). The entire HFC processing team will receive training in procedures (including out-sourcing) with annual re-training. New employees will

	receive initial training as part of job entry orientation procedures. At this date, waterproof lumber tally sheets and shipping manifest forms have to be ordered. Examples are included in this flow chart description. Examples of the final forms will be sent to Smart Wood as soon as they are received.

CASE # 3: HFC decides to work with CERTIFIED wood ONLY and a centralized production system.

Step	Procedure
1- Log Yard	Logs arrive (Create: LOG TRUCKING SHEET) are graded and tagged (Create: HFC LOG TALLY FIELD SHEET- grading rules and pricing list are on the reverse of the tally sheet) Other information like landowner, resource manager, etc. will be used for Smart Wood C-O-C requirements as well as for landowner and other internal management uses. Certified wood (logs) may or may not be "anchor-sealed", and the color will be "clear", or, "no color". Since all of the wood processed at HFC will be certified, “no color” will help reduce internal operating costs. A final summary will be prepared from the "log field tally data. Copies will be kept in appropriate office files. <Missing Step>
3- Possible NEXT STEPS	1- Green Lumber. Lumber may be sold as certified "rough green" material. When it leaves HFC's yard, our "chain of custody" paperwork requirements end with the "SHIPPING MANIFEST", and will indicate certification status. Lumber information is included. Customers will be notified (in addition to manifest data) as to load "certification status". 2- Kiln-Dried Lumber. Lumber may also be sold as certified kiln dried "rough" lumber. Chain of Custody responsibility is the same as step 3.1. 3- Manufactured Products. When HFC develops in-house ability to manufacture kiln-dried rough lumber into finished product, the lumber tag will accompany the unit of lumber through the kiln, milling process and shipping procedure (described in step 3.1). 4- Value-Adding Activities. HFC is responsible for "Chain of Custody" requirements if an outside “secondary manufacturing” entity processes its wood. These out-sources may be incorporated to the HFC and use the HFC certification. For this, the out-sourcing must be done by entities dealing with certified products ONLY and HFC must maintain ownership of the products. If these entities must work on non-certified wood, the other option is for them to obtain independent certification from Smart Wood. If so, it must be assured that HFC's wood is received, milled, and

	re-packaged (by unit) and that associated paperwork maintains the integrity of the "chain-of-custody" process. The finished lumber can be returned to HFC for shipping as described in step 3.1, or, can be shipped from the out-sourced entity location. If the latter occurs, HFC will deliver a finished shipping manifest to be attached to finished products at the vendor's location with all appropriate product information, as well as physical notification of customers as to certification status.
4- Data Management	Copies (hard and computer disc) of all appropriate paperwork by certification status will be maintained at the HFC office in a fire proof safe. The entire HFC processing team will receive training in procedures (including out-sourcing) with annual re-training. New employees will receive initial training as part of job entry orientation procedures. At this date, waterproof lumber tally sheets and shipping manifest forms have to be ordered. Examples are included in this flow chart description. Examples of the final forms will be sent to Smart Wood as soon as they are received.

CASE # 4: HFC works with Certified wood products ONLY and several members provide the saw milling, hauling and drying services needed by HFC.

Step	Procedure
1- On-Site Saw Milling.	Saw miller must be trained in grading lumber (on the HFC LOG TALLY FIELD SHEET- grading rules and pricing list are on the reverse of the tally sheet). This sheet or a summary will be prepared from the "log field tally sheet" for the landowner and HFC management/inventory use (HFC LOG TALLY OFFICE SHEET). Logs will be cut according to HFC's guidelines. Sawed lumber with clear anchor-seal or "no color" will be flat stacked for shipping (rough green), or stickered for air drying and/or loading into kilns for drying. A "DAILY SAWMILL TALLY SHEET" will be completed, along with individual "CERTIFIED LUMBER TAG"'s (water-proof paper) which are attached to each unit (stack) of lumber. These tags include SW-COC information as well as HFC management/inventory tracking data. Copies will be kept in appropriate office files in HFC office. HFC office will include other information like landowner's certification information, resource manager, etc. that will be used for Smart Wood C-O-C requirements as well as for landowner, customers and other internal management uses.

2- Possible NEXT STEPS	1- Green Lumber. Lumber may be sold as certified "rough green" material. When it leaves HFC's domain, our "chain of custody" paperwork requirements end with the "SHIPPING MANIFEST", and will indicate certification status. Lumber information is included. Customers will be notified (in addition to manifest data) as to load "certification status". 2- Kiln-Dried Lumber. Lumber may also be sold as certified kiln dried "rough" lumber. Chain of Custody responsibility is the same as step 2.1. 3- Manufactured Products. When HFC develops in-house ability to manufacture kiln-dried rough lumber into finished product, the lumber tag will accompany the unit of lumber through the kiln, milling process and shipping procedure (described in step 2.1). 4- Value-Adding Activities. HFC is responsible for "Chain of Custody" requirements if an outside "secondary manufacturing" entity processes its wood. Training will be required from HFC to that entity to assure that HFC's wood is received, milled, and re-packaged (by unit) and that associated paperwork maintains the integrity of the "chain-of-custody" process. The finished lumber can be returned to HFC for shipping as described in step 2.1, or, can be shipped from the out-sourced entity location. If the latter occurs, HFC will deliver a finished shipping manifest to be attached to finished products at the vendor's location with all appropriate product information, as well as physical notification of customers as to certification status.
3- Data Management	Copies (hard and computer disc) of all appropriate paperwork by certification status will be maintained at the HFC office in a fire proof safe. The entire HFC processing team will receive training in procedures (including out-sourcing) with annual re-training. New employees will receive initial training as part of job entry orientation procedures. At this date, waterproof lumber tally sheets and shipping manifest forms have to be ordered. Examples are included in this flow chart description. Examples of the final forms will be sent to Smart Wood as soon as they are received.

6- Comments on the tracking systems

There is a wide range of tracking systems that may fit well to HFC. Selecting one or a combination of several systems will depend on factors such as (1) initial cost, (2) its match with HFC's (sequential) operations, (3) level of accuracy and efficiency needed, etc.

BAR CODING SYSTEM. Since the HFC Board decided on using a bar coding system, I have made emphasis on this possibility and enclosed some information/quotes from companies offering bar coding equipments (Appendix II).

Any bar coding system will require the following hardware: a PC (between $750 and 1,000), a barcode printer ($1, 500 to 3,000), and a barcode scanner ($500). There are several software programs that will make these parts work together, and they can be quite expensive (For an example of those more versatile and robust systems to which HFC may want to upgrade later on, see Appendix II) However, some companies have been able to utilize Microsoft database applications such as ACCESS and EXCEL, which are very popular and economic to utilize barcodes. Using ACCESS or EXCEL might be the best way for HFC to go on this (in Appendix II, see email from Computer Logix, Inc. They work with ACCESS and bar coding)

Scenario: If HFC maintain its decisions of (1) working only with certified wood and (2) not to own equipment and facilities, but to support members to invest on them and provide the services to the coop, then I can see the following bar coding system in place:

1- HFC will have a PC with a software program that utilizes MS Access to read and write bar codes, and a barcode printer. Printing barcodes is increasingly more inexpensive and some companies offer material at reasonable prices (see Appendix II for prices).
2- There will be two or three cordless barcode scanner (the gun-shape type), each with a keypad that allows for data entry (besides the barcode information scanned) These scanning guns will travel with the portable saw mills and the information can be uploaded to the office computer at the end of the day or when convenient. Likewise the kiln, and even transportation will have these cordless scanners. At the warehouse, however, scanning devices will be connected to a central computer and data will be processed right away.
3- The company providing the system will have a, for a reasonable fee, a customer support service, in case of difficulties with the system.

PAINTING LOG ENDS. This system requires that each member's logs be color-coded by painting on one end of each log. Likewise, later products made from these marked logs must carry on the same paint color. This can be a suitable method for HFC since other similar coops like Sustainable Wood Cooperative has implemented it and it appears to be well known by some organizations promoting certification (for instance, the Community Forestry Resource Center; 612-870-4846). This system, however, seems to require that all members bring their logs to a (central/single) log-yard and/or sawmill. This seems to go against HFC's principle of decentralizing the provision of services from the members to the coop. This method also requires a tenacious marker and **John Peters** seems to be a good source of information on this.
(This is the method shown on the four (4) case scenarios given in the above tables)

ORDER TRACKING SYSTEM. This method proposes to track the order as a Unit regardless of its composition and product diversity. In general, an order will be placed and a Master form will flow with the order throughout the processing chain; just before making delivery to the customer, the order will be re-assessed for quality purposes.

In more details, this tracking system may require a sequence of events as the following:
a. HFC office receives an order; HFC office calls member(s) to fill that order; (member him/herself calls the logger, if needed) and HFC office passes order to the saw miller.

b. Saw miller comes to the specified forestland; enter data (about logs) into inventory; cuts logs into lumber; stacks it by grade; makes banded packs; and enters data into inventory.
c. Transportation picks up the lumber packs; only certified product is carried at any one time; and delivers it to the kiln.
d. The kiln will locate this order together as a whole in the facility and apart from any other material. Having no non-certified products at all in the room when drying certified product must be strongly encouraged. If there is any non-certified material, it must be kept apart from certified one.
e. Transportation picks the order up from the kiln; and delivers it to warehouse.
f. Warehouse receives (order) material; takes the packs apart; check for quality of the product; fills customer's order to strict guidelines; and ships order out.

(For more information on the Order tracking idea and some critiques to it, see Appendix I)

My major concerns with these tracking systems are that: (1) Smart Wood's sustainable forest management guidelines will require that a member maintain and harvest different species on his/her forestland proportionally. Orders will generally come for the high-end species, but the members are left with the low quality material. Solutions must be sought for the material (like Birch) with low demand. Maybe chipping it for animal bedding, selling it for pulp, etc may be considered, but still no profit is likely to be made from these; (2) the type of customer dealing with HFC will demand a more or less sophisticated tracking system. For instance, Home Depot would probably not buy any wood product that does not carry a barcode since strict tracking is crucial to the business; and (3) regardless of the geographical location of HFC's customer base, HFC's volume of production/business sooner rather than later will require a more sophisticated system, so the question is: would it be more economic/strategically advantageous/appropriate to install a bar coding system now or 2 years down the road?

7- Final Thoughts

1- Before deciding on a tracking system, it seems adequate and necessary that HFC make two major operational decisions:
    a. HFC will work with both certified and non-certified wood or with only certified one. If HFC dealt only with certified product, the major purpose of any tracking system to keep certified wood from being contaminated by non-certified is automatically eliminated. The remaining function of the tracking system is to document the flow of product and some additional information (like its certified origin) helpful to Smart Wood monitoring. I know the HFC Board already decided that all members must aim at obtaining certification. However, there are valid reasons (such as to increase cash flow, productivity of coop's assets, and products of members already waiting for certification approval) for which HFC will be pressured to process and market non-certified products; and those potential situations must be foreseen and evaluated to make this vital decision today;
    b. HFC will have a (semi) centralized processing or instead its members will be encouraged to invest on the sawmills, kilns, and hauling equipments to serve the

coop. This affects the type of tracking system to choose because it dictates the type of hardware needed by the bar coding system and/or the type of materials (paints, bands, etc) used by saw millers under the painting log ends system. Furthermore, for those members providing certain services may make sense to partially invest in the tracking system separately. I can imagine, the sawmill, kiln and hauling personnel armed with cordless scanning guns (also with keypads for convenient data entry) whose information can be uploaded to a central computer in the HFC office. This may be an affordable option for HFC (at this moment I am waiting for a quote from Computer Logix, Inc. (see Appendix II).

2- After these two major decisions are made, HFC may want to explore further the most appropriate tracking systems given here. Contact names, companies, phone/fax numbers, emails and detailed information are carefully provided to ease future communication. In the case of painting log ends, there is field experience in the region and it is highly recommended that somebody from HFC visit the facilities where such a systems is in place (the Sustainable Wood Coop).
3- When a final decision on the tracking system is reached a copy of the proposal (of the future plan) should be sent to Smart Wood for evaluation before making the field adjustments.

P. S. Note:

I have enclosed:

1- Appendix I, which contains a review and comments on the **ORDER TRACKING SYSTEM**;
2- Appendix II, that offer information on **BAR CODING** and what companies offer in that subject;
3- For the **PAINTING LOG ENDS** system, see the tables outlining the four potential cases by which HFC might be operating (which are described by using this system);
4- A floppy disc that contains this complete document, an Excel log grading and pricing program, and some of the material found in the Appendixes; and
5- A copy of this document was sent to Greg Nolan by email format too.

Appendix I

(The following was reviewed by **Chuck Ouimette**)

Hello Katie:
I am trying to finish up a final report for the Headwaters Forestry Cooperative (HFC). I remember that you are familiar to certain extent to this coop and to the C-O-C certification process. I have an idea outline below on which I would love to hear your feedback (especially on how practical it sounds and its pitfalls). But first, as you may know, this coop has not started its operation so there is limited budget and members do not want to take risks, so I have been asked to find an effective but economic way to track the certified wood products so the organization can comply with Smart Wood certification guidelines. So I am basically looking for a pencil and paper system for now, and a computerized one for later on.

The following table gives some additional information on how the HFC Board foresees the coop functioning.

Edited Pre-Report on a Tracking System

Types of **Operations**	**Handling of Steps**	**Procedure COMMENTS IN "CAPS" AND RED**	**Tracking/Forms (OTHER COMMENTS)**
Landowners	Certified Landowner	Log ends are bar-coded. Logs are scaled. **AND GRADED** Logs loaded on truck **FOR SAWMILL**, or sawed on site. Data entered into inventory.	
Sawmill	Saw milling	Sawmill receives copy of lumber order from the HFC's Office. Logs arrive and are stored. **BY SPECIES, GRADE AND LENGTH** **SAWED** Lumber stacked by **SPECIES**, grade **AND LENGTH.** Lumber data entered into inventory. Lumber packs banded, stored and air-dried.**?** Load is shipped.	**IN ORDER TO AIR DRY, LUMBER HAS TO BE STICKERED – CANNOT TRUCK STICKERED WOOD – THINGS CAN SHIFT, AND SINCE LOADS ARE DETERMINED BY WEIGHT AND VOLUME, STICKERED WOOD WOULD SHIP LESS FINAL VOLUME THAN FLAT STACKED MATERIAL.**
Drying	Kiln Operation	Packs are placed into dry kiln facilities.	**TYPICALLY SHIP "ROUGH GREEN" FLAT STACKED WOOD, AND THEN LUMBER IS STICKERED AT THE KILN SITE.**
Value-Added and Milling	Value-added Businesses	Packs arrive with bar codes and are graded **(ALREADY DONE WHEN SAWED).** Milled linear feet are added to inventory. Milled wood is shipped to	**GRADING IS TYPICALLY DONE WHEN SAWED. IF WAIT UNTIL AFTER KILN, IT IS A LITTLE HARDER TO SEE DEFECTS ON BOARDS.**

		warehouse. All certified lumber transferred to these businesses would follow the protocol to handle certified material (and working exclusively with certified material is the best way to go about it).	**IF YOU CAN, TRY TO SAW FOR ORDERS (AS YOU MENTIONED IN THE FIRST SECTION). THEN, WHEN THE WOOD IS MILLED, YOU CAN SHIP RIGHT AWAY. IF WOOD IS LEFT IN A WAREHOUSE THAT IS NOT CLIMATE CONTROLLED, THE WOOD WILL START TO REGAIN MOISTURE (ABOUT 1% – 1.5% / MONTH) UNTIL IT REACHES THE EQUILIBRIUM POINT (ABOUT 13% MOISTURE CONTENT IN YOUR AREA). IF THE PRODUCT IS FLOORING, AND THE PRODUCT IS INSTALLED AT 13%, THERE WILL BE SHRINKAGE – AND UNHAPPY CUSTOMERS.**
Warehousing	Receiving	All units are grouped in bundles of same kind. Wood units data entered into inventory. Wood stored in yard and/or warehouse.	**PLAN TO STORE CERTIFIED AND UNCERTIFIED WOOD IN SEPARATE (DESIGNATED AND LABELED) AREAS.**
Purchasing	Customers	Customers will be able to purchase certified wood products from the warehouse, purchase a piece of furniture made by HFC through one of it Value-Added businesses, and certified wood for their wood related projects. Filled sales are entered into database.	**JUST A THOUGHT – PROVIDE A "CERTIFICATE OF AUTHENTICIY" FOR EACH CUSTOMER, WITH YOUR COOP'S NAME, CoC (CHAIN OF CUSTODY) NUMBER (WHEN YOU GET IT) DONE ON SPECIAL PAPER (CAN BE A PROGRAMMED PRODUCT, WHERE YOU ENTER THE CUSTOMER'S NAME, DATE, AND WHAT THE PRODUCT IS + SIGNATURE OF COOP PERSON) – CAN BE EASILY GENERATED UPON ANY PURCHASE – THIS WILL BE A POWERFUL MARKETING TOOL FOR YOUR GROUP – AND MAKE YOUR CUSTOMER VERY HAPPY.**

PART II: Recommendations

Regardless of the tracking system chosen, a Chain of Custody system, for HFC, must meet the following three conditions:

- First, certified and non-certified wood must be kept separated during the processing (**FROM LOGGING TO FINAL STORAGE AND SALE);**
- Second, a labeling system must be established to both distinguish certified wood as it comes in (to the mill, shop, etc.) as well as to identify it with a FSC label for the consumer when it is marketed; and
- Third, the movement of wood must be demonstrated through a record keeping system to record incoming and outgoing volumes at each processing stage. **(THIS WILL ALSO PROVIDE AN INVALUABLE MANAGEMENT TOOL, AS IT HELPS IDENTIFY PRODUCTION "BOTTLENECKS", OPPORTUNITIES FOR CORRECT EQUIPMENT ADJUSTMENT / PURCHASES, AND "ON-CALL" MANAGEMENT IFORMATION FOR STAFF AND BOARD.**

HFC may address these three conditions as follows:

- For the first one, HFC should use ONLY certified wood. In other words, HFC membership should be composed of certified landowners only. **(PLEASE SEE ATTACHED SPRING GREEN SMARTWOOD (FSC) CERTIFICATION FLOW SHEET.**
- For the second, painting the ends of logs to distinguish different landowners and then having printed tags or stickers to put on finished products may be a solution. **(SPRING GREEN PAINTS THE ENDS OF LOGS THAT ARE UNCERTIFIED WITH ORANGE PAINT – AND STORES THEM IN A SEPARATE PART OF THE YARD. THIS ALLOWS FOR RECEIVING UNCERTIFIED WOOD AND THEREFORE MORE BUSINESS FOR THE COOP – YOU MAY SOMEDAY PROVIDE "CUSTOM" WORK (SAWING, DRYING, MILLING) FOR CASH FLOW, AND SHOULD THEREFORE MAKE PROVISION FOR ALL WOOD (CERT. & UNCERT.) TO BE PROCESSED THROUGH YOUR FACILITY.)**
- For the third, there are simple alternatives to create effective databases (i.e. Microsoft Excel, Microsoft Access, etc.). **(I WILL ATTACH EXAMPLE EXCELL SPREADSHEET CURRENTLY BEING USED AT SPRING GREEN).**

Under these conditions, my (tentative) recommendations are:

2- The HFC Board should encourage and organize its membership to invest on the equipment and services needed to process the coop's commodity. This means that members should have the first opportunity to provide the logging, saw milling, transportation, drying, and value-adding services needed by the coop. Investments from inside the coop (individual, and/or groups of members) can be promoted by guarantying investors of an adequate volume of business (i.e. perhaps through legal contracts). The quality and costs of these services must remain competitive with those in the region. Only if members are not interested, the services will be outsourced.

3- The HFC Board must decide whether to invest on a computerized tracking system from the beginning. If so, the company offering the best product must be identified (See Appendix II). However, if HFC decides for a simpler system to start with, tracking the

products in the following way may be desirable: **THE "JUNIPER" SYSTEM IS SUPPOSED TO BE VERY GOOD BUT EXPENSIVE ($12,000+) – LET ME KNOW IF YOU WANT FURTHER INFORMATION ON THIS.**

a. HFC office receives an order; HFC office calls member(s) to fill that order; (member him/herself calls the logger, if needed); and HFC office passes order to the saw miller.
b. Saw miller comes to the specified forestland; enter data (about logs) into inventory; cuts logs into lumber; stacks it by **SPECIES**, grade **AND LENGTH**; makes banded packs **(CONTRACT SAWYER MAY HAVE TO BE PROVIDED WITH BANDING MATERIAL – NEW SETUP OF BANDING (PLASTIC), STRETCHER AND CLIP BINDER RUNS ROUGHLY $400 – $500);** and enters data into inventory. **(IS THE SAWYER A COMPANY EMPLOYEE? – MAY HAVE TROUBLE GETTING THE COUNT, ETC., DONE THROUGH A CONTRACTOR. YOU MAY BE BETTER OFF HAVING A COOP RESOURCE MANAGER OR COORDINATOR COMPLETE ALL OF THIS – BETTER CHANCE FOR ACCURACY – IF SAWYER IS BEING PAID BY THE BOARD FOOT PRODUCED, THEN A COOP PERSON DOING THE FINAL COUNT MAKES EVEN MORE SENSE). "END SPLITTING OF LOGS (AND THEREFORE LUMBER) CAN BE GREATLY REDUCED BY USING A "WAXY" END COATING MATERIAL LIKE "ANCHORSEAL". VERY INEXPENSIVE DYES CAN BE PURCHASED FROM THE SAME COMPANY AND ADDED TO THE CLEAR ANCHORSEAL TO GIVE YOU A "COLORED" END SEAL. THIS SERVES TWO PURPOSES – PROTECTS THE LUMBER FROM END SPLITTING AND PROVIDES "COLOR CODED PRODUCT MANAGEMENT AND INVENTORY" CAPABILITY.**
c. Transportation picks up the lumber packs; only certified product is carried at any one time **(DOESN'T HAVE TO BE – IF YOU USE A UNIQUE COLOR ON THE END OF LOGS FOR "UNCERTIFIED", THEN ALL OTHERS LOGS ARE CERTIFIED. YOU CAN USE DIFFERENT COLORS FOR OWNERSHIP, JOB, ETC., AS LONG AS ONE COLOR IS EXCLUSIVELY USED FOR UNCERTIFIED. IF THIS IS DONE, THEN YOU WON'T "HAMSTRING" THIS PORTION OF YOUR DELIVERY SYSTEM – EG - A TRUCK HAULING 2/3 OF A LOAD OF CERTIFIED AND THE REST UNCERTIFIED);** and delivers it to the kiln. **CERTIFIED AND NON-CERTIFIED CAN BE HAULED, IT JUST HAS TO BE KEPT SEPARATE BY TAG AND COLOR.**
d. The kiln will locate this order together as a whole in the facility and apart from any other material. Having no non-certified products at all in the room when drying certified product must be strongly encouraged. **SAME ARGUMENT AS ABOVE**
e. Transportation picks the order up from the kiln; and delivers it to warehouse.
f. Warehouse receives (order) material; takes the packs apart; check for quality of the product; fills customer's order to strict guidelines; and ships order out.

By tracking the order as a whole, record keeping is made less time consuming and simpler to do accurately without the need for bar coding and computers.

JUST FOOD FOR THOUGHT – ASSUME THAT AN ORDER COMES IN FOR 1,000 BOARD FEET OF RED OAK RUSTIC FLOORING. THE ORDER GOES OUT TO A LANDOWNER (IN YOUR EXAMPLE) AND LOGS ARE IDENTIFIED FOR HARVEST FROM A STANDING

FOREST. THE TREES ARE MARKED, CUT, SKIDDED, AND PILED FOR TRANSPORTATION TO A FACILITY, OR FOR SAWING ON SITE. THE RED OAK LOGS ARE SCALED AND GRADED. SOUNDS SIMPLE AND STRAIGHT FORWARD TO THIS POINT – THINGS TO CONSIDER:

1. **WHEN STANDS ARE MARKED FOR SELECTIVE CUT, IT IS RARE THAT A SINGLE SPECIES WILL BE HARVESTED. A STAND IS A COMPLICATED BIOLOGICAL UNIT MADE UP OF SEVERAL TREE, BUSH AND SHRUB SPECIES THAT HAVE BEEN INTERACTING WITH EACH OTHER FOR A LONG TIME, AND ARE IN THE CONDITION THEY ARE IN DUE TO PAST PRACTICES (HIGH GRADING, PASTURE, ETC.) IF ONLY RED OAK IS SELECTIVELY CUT (IN OUR EXAMPLE) THEN REDUCING THE PHYSIOLOGICAL STRESS IN THE STAND FROM THIS MANAGEMENT TECHNIQUE OR APPROACH MAY BE INCOMPLETE, LEAVING THE STAND IN LESS THAN OPTIMUM CONDITION - WHICH IS THE WHOLE POINT OF MARKING A STAND. IN ADDITION, LOGGERS MAY "HANG UP" A TREE, NECESSITATING THE HARVEST OF AN UNMARKED TREE WHICH MAY OR MAY NOT BE A RED OAK. THIS NOW COMPLICATES THE FINAL HARVEST VOLUME.**

2. **LOGS ARE SCALED AND GRADED. *SCALING* ENTAILS MEASURING THE DIAMETER INSIDE THE BARK ON THE SMALL END OF THE LOG IN INCHES (DIB-SE), THE LOG LENGTH IN FEET, AND DEDUCTING (IF WARRENTED) VOLUME DUE TO ROT, SPLITS, LOG SWEEP, ETC. SCALING CAN BE DONE USING DIFFERENT INDUSTRIAL SCALES. I BELIEVE THE RULE USED IN YOUR AREA IS "SCRIBNER DECIMAL C". THIS SCALE WAS DEVELOPED NEAR THE TURN OF LAST CENTURY. TO MAKE THE HAND TALLIES MORE FUNCTIONAL, FINAL CALCULATED VALUES WERE ROUNDED TO THE NEAREST 10 (TEN) BOARD FEET. FOR EXAMPLE, A 16" DIB-SE, 16 FOOT LONG LOG SCALES OUT AT 160 BOARD FEET SCRIBNER SCALE. SCALING WITH SCRIBNER AND SAWING WITH (EG) A WOOD-MIZER SAWMILL WILL RESULT IN A DIFFERENT AMOUNT OF FINAL PRODUCED LUMBER. SCRIBNER WAS DEVELOPED USING A ¼" SAW BLADE THICKNESS, OR "KERF". THE WOOD-MIZER HAS A 1/16" KERF, RESULTING IN 20-40% OVER-RUN OF LUMBER FROM THE SAME LOGS. IN OUR EXAMPLE OF 1,000 BOARD FEET OF SCRIBNER SCALED LOGS WE MAY END UP WITH 1,200 – 1,400 BOARD FEET USING A BANDSAW MILL. *GRADING* IS THE PROCESS OF CORRECTLY IDENTIFYING THE "QUALITY" OF A LOG – SOME GRADES INCLUDE VENEER, #1, #2, #3, AND #4. IN ADDITION, DEPENDING ON THE LOG GRADE, DIFFERENT PERCENTAGES OF GRADE LUMBER WILL BE RENDERED FROM EACH LOG. SOME LUMBER GRADES INCLUDE "SELECT AND BETTER", # 1 COMMON, # 2 COMMON, # 3 A, ETC. A # 1 LOG WILL SAW OUT A MUCH HIGHER PERCENTAGE OF SELECT AND BETTER LUMBER THAN A # 4 LOG. OUR ORDER (EG) IS FOR 1,000 BOARD FEET OF RUSTIC FLOORING. THIS MATERIAL USUALLY CONTAINS KNOTS, COLORATION, ETC. – IT IS THE LOWER GRADE LUMBER. IN THE PROCESS OF SAWING OUR 1,000 BOARD FEET OF SCRIBNER SCALED LOGS, WE WILL GENERATE SOME RUSTIC MATERIAL, AS WELL AS HIGHER GRADE CLEAR LUMBER DEPENDING ON LOG GRADE, SIZE, LENGTH, ETC. THE AMOUNT WILL DEPEND ON LOG GRADE, ETC.**

3. **WHEN THE WOOD IS KILN DRIED, SOME DEFECT MAY OCCUR, RESULTING IN SOME LOST VOLUME.**

4. **WHEN THE LUMBER IS MILLED, THE PROCESSING LOSS MAY EXCEED 50%. THIS MEANS THAT YOU HAVE TO START WITH OVER 2,000 BOARD FEET OF KILN DRIED ROUGH MATERIALWHICH IS IDENTIFIED AS #2 TO #3 LUMBER TO END UP WITH 1,000 BOARD FEET OF RUSTIC FLOORING.**

5. **THE POINT OF ALL OF THIS, IS THAT YOU WILL MOST LIKELY NOT BE ABLE TO (OR DESIRE TO) GO TO THE WOODS, PICK OUT A FEW TREES, AND ACCURATELY FILL AN ORDER OF FINISHED LUMBER TO THE BOARD FOOT. THE FOREST IS NOT LIKE A RETAIL STORE, WHERE YOU PICK OUT A FINITE AMOUNT OF SOME PRODUCT (WHETHER IS IS GROCERIES OR LUMBER). THIS MEANS THAT YOU MOST LIKELY HAVE EXCESS MATERIAL, BOTH LOGS AND LUMBER. THIS WILL HAVE TO BE TALLIED AND KEPT SEPARATE. PART OF THE MARKETING CHALLENGE WILL BE TO HAVE "A HOME" FOR THE EXTRA PRODUCT. IF YOU HAVE PILES OF LOGS AND LUMBER SITTING AROUND WITH NO MARKET, YOU REALLY HAVE DOLLARS THAT HAVE NOT FOUND THEIR WAY TO THE "BOTTOM LINE", AND SHOULD BE SOLD AS SOON AS PRACTICAL..**

Forms flowing with the lumber packs or pallets, which are grouped by individual order, would allow for each handler to make prompt and accurate data inputs/updates without the need for additional training of those dealing with the product at any one time. However, it is expected that HFC volume of business sooner rather than later will require a more sophisticated system and then considering the information in Appendix II is highly recommended.

4- If a pencil and paper tracking system is employed (as suggested in point 2 above) HFC may want to design a form that flows at all times with the product. This form must include all the processing stages from the moment the coop takes ownership of the logs to the moment the customer takes ownership of the final product. Such form may look like the following (example) table: **SHOULD ADD LENGTH AND GRADE TO YOUR TALLY BELOW – YOU WILL NEED IT TO PROPERLY COMPENSATE THE LANDOWNER**

Order #: PKHFT Customer: XYZ Delivery Date: --,--,--

Processing	Item	In-Date	Out-Date	Dimensions (LxW or D)	Quantity	Price/Unit ($)	Total ($)
Sawmill	(9) Oak logs	Jun 24,01	Jun, 25,01	8x2	9		
Kiln	Flooring	Jun 25,01	Jun 28,01	3ftX2in	500		
Warehouse	Flooring	Jun. 28,01	Jul 01,01	3ftX2in	500	3	1,500

It would be recommended that loggers provide the sawmill with a form containing information such as type of trees, number of logs, and their dimensions. The sawmill must confirm and then input these data as inventory data, participation record of coop members, and for payments to members. This form may look like this: **LOGGERS SELDOM PROVIDE THIS**

DATA AS IT IS THE BASIS BY WHICH THEY ARE PAID BY – IT CAN BE A CONFLICT OF INTEREST. THE COOP COORDINATOR SHOULD PROBABLY DO THIS – IT WOULD BE ON THE "RIGHT SIDE OF THE FENCE" (I HATE FENCES, BUT FOR PROPER HANDLING, THE PERSON SHOULDN'T BE COLLECTING AND INPUTTING THE DATA THAT THEY ARE COMPENSATED FROM).

Date:--,--,-- Member's Name:FHGHGK Certification Code: OHGGJH Logger:JUPLM

Species	Number of Logs	Dimensions

I WILL ATTACH A COPY OF THE LOG ENTRY FORM THAT SPRING GREEN USES.

Katie, your feedback is most needed on, as I said, how practical tracking an entire order seems to be; how that meets the certification requirements; and how much people throughout the processing chain will accept it and handle it.
Do you have any recommendations for me at this point?

Thanks.
Otto Garcia/

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June 25, 2001

Otto Garcia
Headwaters Forestry Coop

VIA EMAIL: garc0080@umn.edu

Otto:

I have prepared the attached quotation for the Inventory Tracking System, based on our telephone conversation. This project uses a commercially available inventory tracking software package, known as IntelliTrack. The IntelliTrack system is designed around a Microsoft Access database and is completely customizable. The system will utilize two (2) PSC Falcon 310 portable data collectors to retrieve the product data from the field. These terminals will be synchronized with a computer terminal at your main facility, which will interface the terminals with the inventory tracking software. A bar code printer at the main location will be used to print the bar code labels that will be attached to the lumber at the remote locations. I have attached specification sheets for the IntelliTrack software, Falcon terminals and Eltron bar code printer.

Since the IntelliTrack design environment is easy to use, I would recommend that your company simply purchase the software and perform the installation and configuration in-house. If needed, Computer Logix can perform the customization based on your requirements. The hourly rate for software customization is $85 per hour. After reviewing your requirements, I would provide a separate quote for the customization.

The payment schedule for the project is as follows.

Project	**Due Date**	**Percentage Due**	**Amount Due**
IntelliTrack Software	Prior to Delivery	100 %	$1,879.00
Computer System Hardware	Prior to Delivery	100 %	929.00
Bar Code Scanning Hardware	Prior to Delivery	100 %	3,654.00
Bar Code Printing Hardware	Prior to Delivery	100 %	1,009.00
Shipping & Handling	Prior to Delivery	100 %	50.00
Project Total:			**$7,521.00**

Thank you for the opportunity to provide this quotation and I look forward to working together with Headwaters Forestry Coop on this project.

Sincerely,

COMPUTER LOGIX, INC.

Patrick G Loftus
Sales Manager

Inventory Tracking System

Description	Unit Price	QTY	Ext. Price
• IntelliTrack Data Management Software			
• Inventory/Shipping/Receiving Module Single PC (62-004-00)	$1,879.00	1	$1,879.00
		Total:	**$1,879.00**

Computer System Hardware

Description	Unit Price	QTY	Ext. Price
• Computer System	$929.00	1	$929.00
• Pentium III 733 MHz			
• RAM, 128 MB SDRAM			
• Hard Drive, 10.2 GB, EIDE, ATA100			
• CD-ROM Drive, 52X, EIDE			
• Floppy Drive, 3.5"			
• Video & Audio + Stereo Speakers			
• Monitor, 15" SVGA			
• Network Card, 10/100, PCI			
• Keyboard & Mouse, PS/2 + Mouse Pad			
• Operating System, Windows 98			
• Case, MicroATX 200 Watt P/S w/2 Fans + Outlet Strip			
		Total:	**$929.00**

Bar Code Scanning Hardware

Description	Unit Price	QTY	Ext. Price
• PSC/Percon Falcon 320 Portable Data Collector Batch, 8 MB, 16 Line Long Range Laser (70-002-605)	$1,399.00	2	$2,798.00
• Docking Station (00-980-005)	139.00	1	139.00
• Docking Station Cable (00-884-32)	22.00	1	22.00
• Power Supply, Docking Station (00-892-10)	12.00	1	12.00
• Charger, 4 Battery, NiCAD or NiMH (00-870-00)	409.00	1	409.00
• Battery Pack, NiMH (00-864-00)	45.00	4	180.00
• Soft Case (00-910-00)	47.00	2	94.00
		Total:	**$3,654.00**

Bar Code Printing Hardware

Description	Unit Price	QTY	Ext. Price
• Eltron 2746 Bar Code Printer 203 DPI, 6 IPS, 4" Maximum Print Width Direct Thermal/Thermal Transfer Serial/Parallel (2746-10311-0000)	$999.00	1	$999.00
• Printer Cable, Parallel Port, 10 Foot	10.00	1	10.00
		Total:	**$1,009.00**

NOTES:

1. Bar code labels and ribbons required for project. Label size is dependent on the amount of information to be stored on the bar code label, so an accurate quote cannot be provided until the bar code label is defined.
2. Bar code printer specified can print up to a 4" wide label. If a larger width is needed, a different printer will need to be quoted.